National Marine Fisheries Service (NMFS)
Application for a Permit for Scientific Purposes
or to Enhance the Propagation or Survival of Threatened and Endangered Species

Application

A. **Title:**

1. Application for Permit for Scientific Purposes under the Endangered Species Act of 1973.

B. **Species:** *Coho Salmon Oncorhynchus kisutch and Chinook salmon Oncorhynchus tshawytscha in the Lower Columbia River Evolutionarily Significant Unit (ESU).*

C. **Date of Permit Application**: *09/8/2005.*

D. **Applicant Identity:** The applicant is the individual and/or agency responsible for ensuring compliance with permit conditions, and may represent a group of individuals actually performing the activities (e.g., employees, partners, agents, and/or contractors).

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Supervisory Fishery Ecologist
United States Fish and Wildlife Service
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E. **Information on Personnel, Cooperators, and Sponsors.** (If the same person or entity will hold several roles, you may state their address information once and refer back to it).

1. If the applicant will not be the sole person conducting the proposed activities, provide the names, phone numbers, and résumés for each Principal Investigator and Field Supervisor. A Principal Investigator is ultimately responsible for the project and compliance with the permit conditions. A Field Supervisor (who may also be the Principal Investigator), is anyone who supervises or carries out the activities in the field without supervision, and will also be responsible for compliance with the permit conditions.

Principle Investigator: Kenneth G. Ostrand (see attachment 1 for resume).

Field Supervisors: Benjamen M. Kennedy (see attachment 2 for resume).

2. To the extent possible, provide a list of field personnel.

List of field personnel:

Bill Gale
John Holmes
Mike Hudson
Jeff Johnson
John Brunzell
Jeff Hogle
Jeff Poole

3. Please identify the secured or proposed funding source(s) for the proposed activities, including names, addresses, and phone numbers of the sponsors, cooperating institutions, etc.

Secured funding source through Bonneville Power Administration (see attachment 3).

Tracy Hauser, F&W Project Manager
United States Department of Energy, Bonneville Power Administration,
Division of Fish and Wildlife, P. O. Box 3621, Portland, OR 97208
tlnoice@bpa.gov

4. If the proposed activities will be conducted by a contractor, provide a statement that a qualified member of your staff (include name(s) and qualifications) will supervise or observe the taking. Include a copy of the proposed contract or a letter from the contractor indicating agreement to operate under any and all permit conditions, should a permit be granted.

Not applicable.

5. Provide a description of the arrangements for the disposition of any tissue samples, dead specimens, or other remains, either in a museum or other institution, for the continued benefit to science. Include the list of researchers, laboratories, museums, and/or institutional collections that would receive these tissue samples or specimens. Please include name, address, contact, and phone number for each**.**

Not applicable

6. For transport and long-term holding of listed species, please provide the qualifications and experience of all staff responsible for care without supervision, including a written certification from a licensed veterinarian knowledgeable about the requested species (or similar species), or from a recognized expert on the species (or similar species) that he/she has personally reviewed the criteria for transporting and maintaining the animal(s) and that in his/her opinion they are adequate to provide for the well-being of the animal. Include the name and phone number of this veterinarian, consulting expert, or equivalent who will be available during the proposed activities.

   Not applicable.

F. **Project Description, Purpose, and Significance:** Please describe the purpose of your study or project. If available, please attach a copy of the formal project proposal or contract, including the contract number, to your application. You may reference the appropriate section of the proposal/contract in response to a particular question.

1. A justification of the objective(s): motivation, history, goals, etc., and how the wild populations of the species will benefit from the proposed activities;

   Please see attachment 3 where Coho Salmon and Chinook salmon may be subject to take.

2. A statement of whether the proposed project or program responds directly or indirectly to a recommendation or requirement of a Federal agency (Include citations if applicable);

   Our project responds directly to the 1999 National Marine Fisheries Service Biological Opinion of Artificial Propagation in the Columbia River Basin recommendation that federal and state agencies phase out non-native broodstocks of steelhead and replace them with native broodstocks.

3. A statement of whether the proposed project or program has broader significance than the individual project's goals, or is part of a larger scale research management or restoration plan (Include citations if applicable);

   Please see attachment 3 where Coho Salmon and Chinook salmon may be subject to take.

4. A description of any relationships or similarities of the proposed activities to other proposed or ongoing projects and programs, and whether the potential exists to cooperate and coordinate with other similar studies or activities. (Include citations if applicable);

Not Applicable

5. A justification for using listed species in the study or activities, and a discussion of possible alternatives to using listed species and/or to using the proposed methods. If applicable, you should try to anticipate alternative scenarios due to circumstances such as changes in environmental conditions, annual variations in species abundance, necessary changes in proposed procedures, etc. Such scenarios should be addressed in **Description and Estimates of Take** below if they affect the nature or amount of potential take of listed species. This planning may avoid the potentially lengthy process of modifying the permit.

An integral part of the study entitled "Natural Reproductive Success and Demographic Effects of Hatchery-Origin Steelhead in Abernathy Creek, Washington" uses one-pass electrofishing within the middle and upper half of Abernathy Creek, WA to collect and PIT tag juvenile steelhead and cutthroat trout. Generally, low numbers of Chinook salmon enter Abernathy creek near the tail waters (i.e., areas downstream of the middle and upper reaches) to spawn. Typically, Chinook do not use the middle and upper reaches of Abernathy Creek for spawning due to low water flows. However, on rare occasions with abnormally high water flows (e.g., 2004) Chinook salmon may potentially move up into middle reaches of Abernathy creek, thus increasing the probability for take of Chinook. Conversely, coho salmon may enter the upper half of Abernathy Creek. Typically coho immigrate into Abernathy Creek prior to our late fall electrofishing efforts; however, juveniles spawned in a previous year and potentially a few late arriving adults may be subjected to take.

Alternatives actions of conducting the survey earlier or later in the year have been considered. If electrofishing is conducted earlier, high water temperatures have the potential to severely increase mortality of collected and tagged juvenile steelhead and cutthroat trout. Equally important is earlier sampling would most likely overlap with adult coho salmon spawning. If electrofishing is conducted later in the year, high stream flows would severely reduce our ability to collect fish. Additionally, high flows greatly increase the safety risk of electrofishing personnel.

G. **Project Methodology:** Please provide a detailed description of the project, or program, in which the listed species is to be used, including:

1. The proposed duration of the project or program, including start and end dates.

Our project is proposed to last until 2015. During each year the proposed activity will start in late summer when the water temperatures cool to at least 15°C which allows maximal survival of tagged fish. This temperature is usually reached in early to mid September. From the starting date, 15 days of

electrofishing are required to complete the survey leading to the duration of about 3 to 4 weeks depending on weather and equipment. Please see attached study proposal for specific details.

2. A discussion of the procedures and techniques which will be used during the project. The discussion should include, at a minimum:

   a. Method(s) of capture and of release;

      Our proposed activity is to one-pass electrofish Abernathy Creek (UTM coordinates West 487984 North 5120404) from creek kilometer 7 to creek kilometer 16 using a Smith-Root model LR-24. All supervisors and field personnel have been trained and certified to use this electrofisher to minimize the injury to fish by Smith-Root personnel during their principles of electrofishing classes.

   b. A description of any tags, including the attachment method, location, and expected duration of tag attachment;

      No tagging will be performed.

   c. A description of type and dosage of any drugs to be used, purpose of use, and method of application;

      No drugs will be used.

   d. Temporary holding time prior to release of the individual(s) and the manner in which they will be detained (for transport and long-term holding, please fill out the section on **Transport and Holding**);

      Zero fish will be temporarily held.

   e. Number and types of samples to be taken from each individual, including sampling protocol.

      No samples will be taken.

3. A discussion of the potential for injury or mortality to the species involved, and the steps that will be taken to minimize adverse effects and to ensure that the species will be taken in a humane manner.

   Our proposed activity may result in take of a small number of juvenile coho and adult Chinook salmon. To minimize the effect of our activities, electrofishing crews will survey a habitat unit (e.g. pool or run) prior to

sampling for salmon and possible redds. If salmon or redds are present the crew pass over the area ensuring minimal disturbance of any coho and Chinook salmon. Electrofishing will resume at areas void Adult Chinook salmon and/or their redds and juvenile coho salmon.

Abernathy creek is very small stream with few deep pools, therefore this action should eliminate our impact on Chinook salmon and their redds and greatly reduce the potential of coho and Chinook take occurring through electrofishing.

H. **Description and Estimates of Take**: Issued permits define a specific number of individuals of each species that can be taken within the approved study or project. You must provide sufficient detail (in the table or in narrative) for NMFS to determine the species, population group, and estimated number of individuals to be "taken" due to each activity. You should also describe the specific age, size, (and sex, if appropriate) of the listed species targeted. Please take into account alternative scenarios identified above in **Project Description, Purpose, and Significance.**

The description of the listed species to be taken during the proposed activities should include the following:

1. A list of each species and/or population and/or Evolutionarily Significant Unit to be taken including the common and scientific name. Include specific population or sub-population groups if appropriate.

   Chinook salmon Oncorhynchus tshawytscha in the Lower Columbia River Evolutionarily Significant Unit (ESU).
   Coho salmon Oncorhynchus kisutch in the Lower Columbia River Evolutionarily Significant Unit (ESU).

2. The sampling schedule, including locations and dates if available. Be as specific as possible. Locations should be listed from general to most specific, including bodies of water, rivers, tributaries, streams or creeks, and a geographical descriptor (e.g., Columbia River, Snake River, Imnaha River, River Mile 42 or Gulf of Mexico, Louisiana Coast, Sabine Pass). Include latitude/longitude coordinates, if possible.

   Our project will be conducted on Abernathy Creek, WA (UTM coordinates West 487984 North 5120404) from creek kilometer 7 to creek kilometer 16. During each year of the study, the proposed activity will start in late summer when the water temperatures cool to at least 15°C (approximately September 15th) which allows maximal survival of tagged fish. This

temperature is usually reached in early to mid September. From the starting date, 15 days of electrofishing are required to complete the survey.

Electrofishing will be coordinated with Washington Department of Fish and Wildlife. Our sampling effort will be focused on the evaluation the differences between wild and hatchery produced steelhead(see attachment 3; study plan). As a result our electrofishing will be aimed at the collection and tagging of juvenile steelhead and the quantification of all other fish species encountered. Since electrofishing is an indiscriminate method of collection our efforts may result in the take of juvenile and adult coho and Chinook salmon. In addition, our coordinated efforts with the state of Washington, who's work is covered under another permit/authorization, may require us to assist in the PIT tagging of adult and juvenile coho.

3. A description of the recent status and trends of each species and/or population and/or ESU to be taken, relative to the location(s) or area(s) of taking. (Include citations if available).

There are no data on the recent status or trend of Chinook salmon in the Lower Columbia River ESU in Abernathy Creek, WA.
The lower Columbia river coho previously listed as "candidate" has been changed to "threatened" (Listing determinations for 16 pacific salmon ESUs 2005).

4. A description and/or completed summary table (see attached example) of estimated take per annual period, for your activities at each discrete location and/or for each project. Please separate take information into "species profiles"– groups of individuals with the same characteristics that will be undergoing the same procedures (see b-h below). Make sure you do not double-count-- if you propose to capture 50 animals, and tag 5 of those, you should list 45 animals to be captured, and 5 to be captured & tagged. Each "species profile" should include:

a. Number of individuals;

ESU/Species and population group if appropriate	Life Stage	Origin	Take Activity	Number of Fish Requested	Requested Unintentional Mortality	Research Location	Research Period
Lower Columbia River (LCR) Chinook	Juvenile	Naturally Produced	Electro-fishing	300	15/300	Abernathy Creek, WA	September each year
LCR Coho	Juvenile	Naturally Produced	Electro-fishing	300	15/300	Abernathy Creek, WA	September each year
LCR Chinook	Adult	Naturally Produced	Electro-fishing	30	0/30	Abernathy Creek, WA	September each year
LCR Coho	Adult	Naturally Produced	Electro-fishing	30	0/30	Abernathy Creek, WA	September each year

b. Species and/or population and/or ESU;

Chinook salmon, Oncorhynchus tshawytscha, in the Lower Columbia River Evolutionarily Significant Unit (ESU).
Coho salmon Oncorhynchus kisutch in the Lower Columbia River Evolutionarily Significant Unit (ESU).

c. Life stage (such as post-hatchling, fry, smolt, juvenile, immature, adult, etc. (note if live or dead))

Live juvenile/adult Chinook.
Live Parr/adult coho

d. Sex (if known);

Sex unknown.

e. Origin (if applicable, naturally-produced (wild) or artificially-propagated (hatchery));

Naturally produced hatchery origin Chinook.
Naturally-produced hatchery origin coho

f. Take activity category (such as observe/harass; capture and handle; etc.);

Capture, handle (to identify and count), and release through electrofishing and observe/harass by walking next to stream.

g. Location (if more specific than the project as a whole);

Location listed above.

h. Date(s) (if more specific than the project as a whole).

Dates listed above.

5. Estimates of potential annual mortalities by take category, including a justification. You should specify the life stage of the potential mortalities, sex if known, and whether naturally-produced (wild) or artificially-propagated (hatchery). Mortality estimates should be specific by population; by the activity causing the mortality; and/or by location when known. You should specify whether mortalities will be intentional (direct mortality) or unintentional (indirect mortality).

Zero estimated adult Chinook and coho mortalities. Minimal parr/smolt Chinook and coho mortalities (< 15).

6. Provide details on how all take estimates, including mortalities, were derived. Include citations when applicable.

Adult coho and Chinook salmon in Abernathy creek are highly visible because Abernathy Creek is a small 3rd order stream with very few deep hiding places. Therefore, we will be able to see most fish before electrofishing and will be able to move to a new section of stream , thus very few Chinook or coho will be subjected elecrofishing. Since our focus is on the collection of steelhead and cutthroat trout that occupy differing habitats than juvenile Chinook or coho there should be minimal take of juvenile Chinook or coho. Of those Chinook and coho that experience take every precaution will be taken to immediately release fish unharmed; however, the potential does exist that a few juvenile fish will experience fatal injury.

I. **Transportation and Holding** *We will not hold or transport any coho or Chinook salmon.*

1. **Transportation of a Listed Species:** Provide a description of how any live individuals taken from the capture site or other facility (including rescue and relocation activities) will be transported including:

    a. Mode of transportation and name of transportation company, if applicable.

    b. Length of time in transit for the transfer of the individual(s) from the capture site to the holding facility or to the target location.

    c. Length of time in transit for any planned future move/transfer of the individual(s).

    d. The qualifications of the common carrier or agent used for transportation of the individual(s).

    e. A description of the pen, tank, container, cage, cradle, or other devices used, both to hold the individual(s) at the capture site and during transportation.

    f. Special care before, during and after transportation (e.g., use of oxygen, temperature control, anesthetics, antibiotics, etc.)

2. **Holding of a Listed Species:** Describe the plan for care and maintenance of any live individuals, including a complete description of the facilities where any such individuals will be maintained including:

    a. The dimensions of the pool(s) or other holding facilities and the number of individuals, by sex, age, and species, to be held in each.

    b. The water supply, amount, and quality, including controls on temperature and dissolved oxygen.

    c. The amount and type of diet used for all individuals, and food storage.

    d. Sanitation practices used.

3. **Emergency contingencies**: Identify emergency contingencies- e.g., backup life support systems, alarm systems, redundant water and oxygen supply, release or destroy decision chains, etc.

J. **Cooperative Breeding Program:** You must include a statement of willingness to participate in a cooperative breeding program and to maintain or contribute data to a breeding program, if such action is requested.

We would be willing to contribute data to a breeding program if requested.

K. **Previous or Concurrent Activities Involving Listed Species**:

1. Identify all previous permits where you were the permit holder or primary investigator working with federally-listed species. Please identify which species.

   None

2. For the above permits, please list all mortality events of listed species which have occurred in the last five years.

   a. List the species, including scientific name and population where applicable;

   None

   b. Describe the number and causes of mortalities; and

   c. Describe the measures that have been taken to diminish or eliminate such mortalities, and the effectiveness of those measures.

L. **Certification:** You must include the following paragraph, exactly as worded, followed by the applicant or responsible party's name, position title, signature and date:

"I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand this information is submitted for the purpose of obtaining a permit under the Endangered Species Act of 1973 (ESA) and regulations promulgated thereunder, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or to penalties under the ESA."

_____ _____

Signature Date

Name and Position Title

M. **Length of Time and Cost to Prepare Application (Optional):** The public burden of these application instructions is evaluated periodically by the Office of Management and Budget under the Paperwork Reduction Act. Your response will help improve the accuracy of the estimates given for evaluation. You may send comments regarding this estimate or any other aspect of this information collection, including suggestions for reducing this burden, to the Chief, Endangered Species Division, at the address under "**Where Do I Send the Application?**"

1. Please estimate the length of time, in hours, it took to compile this application.
2. Please estimate the cost, in $US, of compiling this application, excluding the labor hours identified in 1. above. This estimate should include: cost of paper, printing, mailing, photocopying, etc.

Attachment 3

NATURAL REPRODUCTIVE SUCCESS AND DEMOGRAPHIC EFFECTS OF HATCHERY-ORIGIN STEELHEAD IN ABERNATHY CREEK, WASHINGTON

Statement of Work and Budget FY2005

BPA Project No. 2003-063-00

Contract Number No. 016522

Contract Period: January 1 2005 – December 31, 2005

Submitted to: Tracy Hauser, BPA (tlhauser@bpa.gov)

Principal Investigators:

Donald E. Campton[1], William R. Ardren, Gayle B. Zydlewski, John A. S. Holmes, Patricia A. Crandell [a], and Kenneth G. Ostrand[a]

U.S. Fish & Wildlife Service

Abernathy Fish Technology Center

1440 Abernathy Creek Road Longview, WA 98632

Prepared for:

U.S. Department of Energy Bonneville Power Administration Portland, Oregon

Contracting Office Representative: Tracy Hauser

October 1, 2004

[1] Contact persons for response: Kenneth_Ostrand@fws.gov; Don_Campton@fws.gov; Patricia_Crandell@fws.gov

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INTRODUCTION

In 1999, the National Marine Fisheries Service (NMFS) issued, in support of the U.S. Endangered Species Act (ESA), a Biological Opinion on artificial Propagation in the Columbia River Basin. In that biological opinion, NMFS concluded that non-native hatchery stocks of steelhead jeopardize the continued existence of ESA-listed, natural spawning populations of steelhead in the Columbia River Basin. NMFS recommended-as a reasonable and prudent alternative (RPA)-that federal and state agencies phase out non-native broodstocks of steelhead and replace them with native broodstocks. However, NMFS provided no guidance regarding how to achieve that RPA.

The development of native broodstocks of hatchery steelhead by traditional methods of trapping upstream migrating adults may pose unacceptable biological risks to naturally spawning populations, particularly those that are already listed as threatened or endangered under the ESA. Trapping adult steelhead may be logistically unfeasible in many subbasins because of high water flows in the spring, when steelhead migrate upstream to spawn. Additional risks associated with trapping adults include genetic founder effects and difficulties meeting minimum, genetic effective number of breeders from a relatively small number of trapped adults and initial spawners. As a result, alternative methods for developing native broodstocks are highly desired.

Rearing wild-caught juveniles to sexual maturity in captivity offers many potential advantages over trapping natural-origin adults including (a) much reduced demographic impacts to natural populations and (b) substantially greater genetic diversity for the founding broodstock relative to the small number of natural-origin adults that would otherwise be

trapped to start a broodstock (Ryman and Laikre 1991; Ryman et al. 1995). The Abernathy Fish Technology Center (AFTC) is investigating the feasibility of this latter approach by developing a research hatchery program for steelhead on Abernathy Creek, WA, a tributary to the lower Columbia River. This research program provides an excellent opportunity to assess the genetic, ecological, and fitness effects of artificial propagation on the genetic constitution of hatchery-produced fish and naturally-spawning populations with which hatchery-origin fish may spawn.

The overall goal of the project described here is to determine the natural reproductive success and mean relative fitness of hatchery-origin (HOR) and natural-origin (NOR) steelhead in Abernathy Creek, WA, and to assess the overall demographic effects of hatchery fish supplementation in Abernathy Creek relative to two adjacent control streams, Germany and Mill Creeks. This work responds directly to the FCRPS[2], RPA Action No. 182[3]. This work was first approved for funding by the Bonneville Power Administration in fiscal year (FY) 2004.

[2] *Federal Columbia River Power System*
[3] *Reasonable and Prudent Alternative Action No. 182 of NOAA-Fisheries in response to their Biological Opinion.*

Hatchery O&M

Objective 1-Develop a "native" or "endemic" hatchery broodstock of steelhead by producing hatchery-origin (HOR) progeny of natural-origin (NOR) captively-reared adults from Abernathy Creek.

Work Element 1: Rear Fish
Work Element Title: Rearing 20,000 F1 steelhead for release into Abernathy Creek

Details: Rear 20,000 F1 steelhead juveniles (BY2004), representing the progeny of NOR captively-reared adults, to the yearling stage prior to release.

Deliverable: Rear 20,000 steelhead

Milestone	Start Date	End Date	Description
Produce 20,000 BY2004 steelhead	1/1/2005	5/15/2005	Ensure survival, health, and growth rates of juvenile steelhead

Work Element 2: Mark and Tag Animals
Work Element Title: Mark/tag all pre-smolt F1 yearlings prior to release from AFTC

Details: Of the 20,000 steelhead that have a coded wire tag and adipose fin clip, 1,000 will be given 23 mm long-range PIT-tags.

Deliverable: 1,000 PIT-tags given to steelhead

Milestone	Start Date	End Date	Description
1000 steelhead will be marked with PIT tag	4/1/2005	5/31/2005	1,000 will be PIT-tagged

Work Element 3: Produce Hatchery Fish
Work Element Title: Release 20,000 F1 steelhead yearlings each year into Abernathy Creek

Details: 20,000 steelhead yearlings (BY2004) will be released into Abernathy Creek directly from AFTC. One-third of the fish will be force released April 15-22, one-third April 28-May 4, and the final third May 8-15.

Deliverable: Release 20,000 steelhead into Abernathy

Milestone	Start Date	End Date	Description
Release 20,000 steelhead into Abernathy Creek	4/1/2005	5/15/2005	Force release steelhead during 3 releases from AFTC

RM&E and Data Management

Objective 2-Estimate total annual smolt out migration of steelhead, coho salmon, and cutthroat trout in Abernathy, Germany, and Mill Creeks.

Work Element 4: Collect/Generate Field and Lab Data
Work Element Title: Estimating annual steelhead, cutthroat, and coho smolt out migration in Abernathy, Germany, and Mill Creeks

Details: Estimate the daily and total number of out migrating smolts of each species in Abernathy, Germany, and Mill Creeks using rotary screw traps. Smolt out migration of steelhead and cutthroat trout, and coho salmon, in the three streams will be estimated by standard methods. A portion of the smolts trapped each day will be marked with a dye and released upstream to generate a simple Peterson estimate of the total smolt out migration for each species in the stream each day. Smolt out migration monitoring will be conducted by the Washington Department of Fish & Wildlife (Dave Seilor, WDFW) and AFTC staff. This work is currently being conducted with "in-kind" funding from the Washington Salmon Recovery Board. Establish smolt production baselines for each species in each stream to assess demographic impacts of hatchery releases and naturally-spawning hatchery-origin adults on natural smolt production in Abernathy Creek (treatment stream) relative to Mill and Germany Creeks (control streams).

Deliverable: Estimate steelhead, cutthroat, and coho smolt out migration in Abernathy, Germany, and Mill Creeks.

Milestone	Start Date	End Date	Description
Estimate steelhead, cutthroat and coho smolt out migration	4/1/2005	5/31/2005	Generate estimates of total smolt out migration from Abernathy, Germany, and Mill Creeks

RM&E and Data Management

Objective 3-Assess physiological status of HOR and NOR steelhead smolts out-migrating from Abernathy Creek.

Work Element 5: Collect/Generate Field and Lab Data
Work Element Title: Monitor changes in physiological status of HOR steelhead at Abernathy AFTC

Details: Juvenile steelhead (HOR, BY2004) will be sampled for physiological assays (35 fish per raceway x3 raceways x 3 time periods = 315 total fish) collected from AFTC on February 15 and April 1 2005 and immediately prior to the release. Gill Na^+, K^+-ATPase and thyroid hormone profiles for those fish will then be determined.

Deliverable: Determine ATPase and thyroid hormone levels for 315 fish reared at AFTC

Milestone	Start Date	End Date	Description
Determine ATPase and thyroid levels for 315 fish	2/1/2005	5/31/2005	Determine the physiological readiness of fish to out migrate via ATPase and thyroid hormone levels (N = 315)

Work Element 6: Collect/Generate Field and Lab Data
Work Element Title: Collect three, stratified, random samples of 35 HOR and 35 NOR steelhead smolts from the downstream smolt trap during the time of active out migration

Details: Lethal samples of HOR (N = 35) and NOR (N = 35) smolts will be collected from the smolt trap immediately after each of the three releases from AFTC (April, and May 1st and 15th 2005). Thus, 105 NOR and 105 HOR smolts will be collected in 2005 for physiological comparisons. An AFTC biologist will work with and assist WDFW biologists during the smolt trap operations in Abernathy Creek.

Deliverable: Collection of NOR and HOR steelhead smolts (N = 210) for physiological and morphological analyses.

Milestone	Start Date	End Date	Description
210 steelhead collected	4/1/2005	5/31/2005	Fish will be collected for physiological comparisons between HOR and NOR smolts

Work Element 7: Collect/Generate Field and Lab Data

Work Element Title: Compare morphological parameters, physiological parameters, and smolt status between HOR and NOR steelhead out migrating from Abernathy Creek

Details: Gill Na^+, K^+-ATPase levels and thyroid hormone profiles, which are established physiological indices of "smolt quality", will be determined for HOR and NOR steelhead (N = 105 fish each) collected from the downstream smolt trap during each of the three sample periods. The two groups of fish will be compared morphologically with respect to truss measurements (length to girth ratios) and overall condition factor.

Deliverable: Assessment of physiological readiness of smolt to out migrate

Milestone	Start Date	End Date	Description
Compare 105 NOR to 105 HOR steelhead for ATPase, thyroid hormone, and morphology	6/1/2005	9/30/2005	Comparing physiological readiness for out migrating HOR and NOR steelhead (N = 210)

RM&E and Data Management

Objective 4-Monitor and evaluate potential residualism, behavioral displacement, and ecological interactions (competition, predation) between yearling HOR steelhead released from the AFTC and NOR salmonids in Abernathy Creek.

Work Element 8: Maintain Instream Structure
Work Element Title: Maintain remote PIT-tag interrogation system

Details: Purchase and install upgrade equipment for remote detection of fish with PIT-tags in Abernathy Creek.

Deliverable: Remote detection of steelhead and cutthroat movements within Abernathy Creek

Milestone	Start Date	End Date	Description
Detection of PIT-tagged steelhead, cutthroat trout within Abernathy Creek	1/1/2005	12/31/2005	Maintain PIT-tag antennas due to exposure to elements and flood events

Work Element 9: Mark/Tag Animals
Work Element Title: PIT-tag steelhead and cutthroat trout within Abernathy Creek

Details: PIT-tag 1,000 NOR steelhead and 1,000 NOR cutthroat trout in Abernathy Creek to determine within stream movements, out migration timing, and population estimates.

Deliverable: Implant 1,000 NOR steelhead and 1,000 NOR cutthroat trout

Milestone	Start Date	End Date	Description
PIT-tag NOR steelhead and NOR cutthroat trout	8/1/2005	10/31/2005	Collect fish within Abernathy Creek and surgically implant PIT-tags

Work Element 10: Submit/Acquire Data
Work Element Title: Use the *Stream width PIT-tag Interrogation System* (SPIS) installed in Abernathy Creek (BPA Project No. 2001-012-00) to monitor within-stream movements of NOR and HOR steelhead in Abernathy Creek and estimate the proportion of residualized steelhead yearlings

Details: We will monitor and estimate potential residualism of HOR steelhead and potential displacement of NOR steelhead via PIT-tag detectors at a permanent antenna installed approximately 1.4km downstream from AFTC. One thousand HOR yearlings will be given 23 mm long-range PIT-tags each year prior to release. Percent of released fish failing to out migrate past the downstream antenna will be estimated after correcting for percent PIT-tag loss estimated from corollary tag retention studies. A backpack PIT-tag detector will also be used to scan Abernathy Creek for residualised steelhead released from AFTC. All PIT-tag data will be used to calculate survival and recapture probabilities using the Cormack-Jolly-Seber population model. Baseline data on natural steelhead populations in Abernathy Creek will evaluated to determine the impacts of released hatchery-origin steelhead on NOR steelhead at the individual and population level.

Deliverable: Assessment of the individual and population level impacts of released HOR steelhead on NOR steelhead populations in Abernathy Creek.

Milestone	Start Date	End Date	Description
Individual and population impacts of HOR on NOR steelhead	4/1/2005	9/30/2005	Acquire data to determine population estimates of NOR and HOR steelhead in Abernathy Creek

Work Element 11: Collect/Generate Field and Lab Data
Work Element Title: Estimate residualism and evaluate ecological impacts by in-stream snorkel surveys and PIT packing

Details: Snorkel surveys of residualized steelhead and potential ecological impacts on natural populations will be assessed. HOR steelhead will be identified visually by the presence of an adipose fin clip. PIT-tagged HOR and NOR fish will be identified using underwater PIT-tag reader. Habitat preferences of HOR and NOR juveniles will be quantified to evaluate competition and predation risks of residualized HOR steelhead. The stomach contents of HOR and NOR juveniles will be quantified. The stomach contents of HOR and NOR steelhead captured during snorkel surveys and of out migrating smolts captured at the screw trap in Abernathy Creek will be examined by gastric lavage to assess potential competition and predation effects of released, steelhead smolts.

Deliverable: Evaluate the ecological impacts of HOR steelhead residuals on NOR steelhead within Abernathy Creek

Milestone	Start Date	End Date	Description
Estimate microhabitat and foraging competition between residual HOR and NOR steelhead	4/1/2005	9/30/2005	Estimate microhabitat use, stomach contents of residual NOR and HOR steelhead within Abernathy Creek

RM&E and Data Management

Objective 5-Use selectively-neutral, DNA markers to determine the amount of genetic change associated with captive rearing of wild-caught NOR steelhead, spawning, and subsequent hatchery rearing of their progeny prior to release as yearlings.

Work Element 12: Collect/Generate Field and Lab Data
Work Element Title: Estimate allele frequencies for each brood year of yearlings released from the AFTC

Details: Fin clips will be collected from 300 yearlings, stratified into three groups of 100 fish by spawning time of their parents, from the 20,000 steelhead yearlings produced, marked, and tagged at AFTC. Multi-locus DNA genotypes, at ten or more microsatellite loci, will be determined for those 300 fish.

Deliverable: Multi-locus DNA genotypes will be determined for AFTC produced yearlings.

Milestone	Start Date	End Date	Description
Prior to release multi-locus DNA genotypes will be determined for the offspring	5/1/2005	9/30/2005	Fin clips will be retained from 300 steelhead offspring produced at AFTC to

produced at AFTC			determine genotypes

Hatchery O&M

Objective 6-Monitor upstream migration and adult returns of steelhead, coho salmon, and cutthroat trout past the AFTC in Abernathy Creek.

Work Element 13: Trap/Collect/Hold Fish-Hatchery
Work Element Title: Determine the total number of NOR adult steelhead, cutthroat trout, and coho migrating upstream past the AFTC.

Details: The new electric barrier weir, a USFWS "in-kind" contribution, will be operated from November 15, 2004 to June 30, 2005 to trap and enumerate all upstream-migrating adult steelhead, and October 15, 2005 to December 31, 2005 to trap and enumerate coho, steelhead, and cutthroat trout.

Deliverable: Determine the number of NOR adult steelhead, cutthroat trout, and coho migrating upstream past the AFTC during the trapping period for the first year of weir operation.

Milestone	Start Date	End Date	Description
Ascertain how many adult steelhead, cutthroat, and coho migrate upstream past AFTC	1/1/05 10/15/2005	6/30/2005 12/31/2005	Enumerate all steelhead, cutthroat, and coho migrating upstream Abernathy Creek

Work Element 14: Trap/Collect/Hold Fish-Hatchery
Work Element Title: Estimate smolt-to adult return rates and total number of adult returns of HOR steelhead released from AFTC

Details: All adult steelhead trapped at the AFTC will be enumerated and scanned for the presence of a coded-wire tag (CWT) and PIT-tag. HOR steelhead will be distinguished from NOR steelhead by the presence of a CWT, AD-clip, and/or stubbed dorsal fin. Length, weight, scales, and fin tissue for DNA analyses will be removed from all adult steelhead (HOR and NOR) trapped at the AFTC.

Deliverable: Estimates of smolt-to-adult return rates

Milestone	Start Date	End Date	Description
Determine smolt to adult return rates of steelhead in Abernathy Creek	1/1/2005	12/31/2005	Scan all steelhead, migrating upstream Abernathy Creek for CWT, Clipped fins, and PIT-tags

			to determine smolt-to-adult rates

Work Element 15: Trap/Collect/Hold Fish-Hatchery
Work Element Title: Pass NOR and HOR adult steelhead upstream of AFTC in a 2:1 ratio, respectively, to spawn naturally (Year 1 passage protocol)

Details: During year 1, two-thirds of all adult NOR steelhead trapped at the AFTC will be passed upstream of AFTC to spawn naturally; one-third will be retained for broodstock. However, the proportion retained for broodstock may be reduced if the total number of NOR adults migrating upstream exceeds 120 fish. During this first year of weir operation, HOR adults will be passed upstream in a ratio of 2 NOR: 1HOR to spawn naturally with NOR steelhead in Abernathy Creek. These ratios and numbers may be adjusted depending on the total number of NOR and HOR adults trapped for broodstock. However, the number of HOR adults passed upstream will not exceed the number of NOR adults passed upstream. Likewise, the number of NOR adults retained for broodstock will not exceed the number of HOR adults retained for broodstock.

Deliverable: Pass NOR and HOR adult steelhead upstream of AFTC

Milestone	Start Date	End Date	Description
Pass steelhead upstream of AFTC, except one third HOR and NOR fish	1/1/2005	6/31/2005	Collect and pass HOR and NOR steelhead upstream of AFTC to spawn in Abernathy Creek

Hatchery O&M

Objective 7- Trap and spawn returning HOR and NOR adult steelhead for broodstock to produce F2 BY2005 HOR progeny for release into Abernathy Creek as yearlings in 2006.

Work Element 16: Spawn Fish
Work Element Title: Develop a genetically integrated broodstock

Details: Trap HOR adults and spawn a minimum of 70 HOR males and 70 HOR females. Retain a minimum of 30 NOR males and 30 NOR females so that progeny fish each year are derived genetically from at least 30% natural origin adults. HOR adults representing BY2002 fish released as yearlings in 2003 are expected to first return to the AFTC as three-year old fish in 2005. From those returning adults, the AFTC will initiate development of a hatchery broodstock that is genetically integrated with the natural spawning population in Abernathy Creek.

Deliverable: Retain NOR and HOR adult steelhead for broodstock

Milestone	Start Date	End Date	Description
Spawn a minimum of 70 HOR male and 70 HOR female and 10 NOR male and 10 NOR female steelhead	1/1/2005	6/30/2005	Produce an integrated broodstock of steelhead at AFTC

Work Element 17: Produce Hatchery Fish
Work Element Title: Spawn adults and cull each F2 full-sib family to equal numbers of eyed eggs to a total number of approximately 25,000 with the goal of producing 20,000 yearlings (smolts) for release

Details: Methods for BY2005 and subsequent brood years of fish will follow the same methods used to produce BY2002-BY2004 fish that were the progeny of captively-reared adults. Adults retained for broodstock will be spawned pairwise where each NOR adult will be paired, as much as possible, with an HOR adult. Fertilized eggs from pairwise mating will be incubated and hatched in health trays on pathogen-free well water (53^{o}F) at AFTC. At the eyed egg stage, each full-sib family will be culled to an equal number of eyed eggs after shocking. For BY2005, each full-sib family will be culled to 350 eyed eggs with the goal of producing 100 full-sib families.

Deliverable: Fertilize, incubate, and cull eggs to produce full-sib families.

Milestone	Start Date	End Date	Description
Produce 100 full-sib families of steelhead	2/1/2005	6/30/2005	Raise and cull eggs to produce full-sib families

Work Element 18: Rear Fish
Work Element Title: Rearing 20,000 BY2005 steelhead for release into Abernathy Creek

Details: Rear 20,000 F2 steelhead juveniles, representing the progeny of F1 HOR X F1 HOR and F1 HOR X NOR adults, to the yearling stage prior to release.

Deliverable: Rear 20,000 steelhead

Milestone	Start Date	End Date	Description
Produce 20,000	2/1/2005	12/31/2005	Ensure survival,

steelhead			health, and growth rates of juvenile steelhead

Work Element 19: Mark and Tag Animals
Work Element Title: Mark/tag all pre-smolt BY2005 yearlings prior to release from AFTC

Details: 20,000 F2 steelhead BY 2005 will be given a coded wire tag and adipose fin clip. In addition, 1,000 of these F2 steelhead will be PIT-tagged**.**

Deliverable: 20,000 steelhead given coded wire tags and adipose clipped. 1,000 steelhead PIT-tagged.

Milestone	Start Date	End Date	Description
20,000 steelhead marked	11/1/2005	11/30/2005	20,000 steelhead given coded wire tags and adipose clipped. 1,000 steelhead PIT-tagged.

RM&E and Data Management

Objective 8-Determine the relative, natural reproductive success of hatchery-origin and natural-origin steelhead in Abernathy Creek upstream of AFTC.

Work Element 20: Collect/Generate Field and Lab Data
Work Element Title: Determine parentage and genetic pedigrees of HOR and NOR steelhead

Details: Using a set of ten highly variable, mircosatellite nuclear DNA loci and parentage analysis we will determine the relative reproductive success of the NOR and HOR steelhead release above the AFTC. Fin clips will be removed from all adults passed upstream during general biosampling and collection of data prior to transfer upstream. We anticipate that between 400 and 500 winter-run, steelhead adults (NOR + HOR) will be passed upstream between November 2004 and April 2005. Reproductive success will be estimated by determining the proportion of 500 young of the year steelhead, Brood year 2005, sampled from Abernathy Creek that were parented by the 2004 run year adult fish released above the weir to spawn.

Deliverable: Construct genetic pedigrees of HOR and NOR steelhead

Milestone	Start Date	End Date	Description
Produce genetic pedigrees of NOR and HOR steelhead	6/30/2005	12/31/2005	Determine parentage and pedigrees for steelhead in Abernathy Creek

Work Element 21: Collect/Generate Field and Lab Data
Work Element Title: Determine multilocus, microsatellite nuclear DNA genotypes of all natural-origin and hatchery-origin adult steelhead trapped at the AFTC

Details: All of the NOR and a subset of HOR adult steelhead trout returning to the Abernathy Creek weir will be genotyped at the set of ten microsatellite loci used for parentage analysis. Multilocus genotypes for all of the steelhead trout released above the weir to spawn naturally in Abernathy Creek will be entered into a database and will serve as the set of potential parents for the NOR 2005 brood year fish sampled in future years. The multilocus genotypes of the adults spawned in the hatchery will also be recorded into a database allowing us to identify to parents, via genetic analysis, of all the HOR 2005 brood year fish sampled in future years. HOR adults not passed upstream or retained for broodstock (i.e. "surplus" adults) will not be genotyped.

Deliverable: Determine multilocus, microsatellite nuclear DNA genotypes of all NOR and HOR steelhead trout (estimated to be 1000 fish) returning to the Abernathy Creek weir during the 2004 run year and either passed upstream or retained for broodstock.

Milestone	Start Date	End Date	Description
Determine multilocus, microsatellite nuclear DNA genotypes	1/30/2005	12/31/2005	Establish genetic database to conduct parentage analysis

Reporting

Objective 9-Communicate work and results to BPA and the scientific community.

Work Element 22: Produce Status Report
Work Element Title: Quarterly reports

Details: Prepare and submit quarterly reports to BPA. PISCES milestone reports will act as a placeholder until the system is up and running and may replace the quarterly reports.

Deliverable: Quarterly reports

Milestone	Start Date	End Date	Description
Submit quarterly report to BPA	1/1/04	2/15/05	Report submitted to BPA
Submit quarterly report to BPA	2/15/05	5/15/05	Report submitted to BPA
Submit quarterly report to BPA	5/15/05	8/15/05	Report submitted to BPA

Work Element 23: Manage & Administer Project
Work Element Title: FY06 Statement of Work

Details: Prepare updated proposal and Statement of Work (SOW) for upcoming year and contract renewal from BPA. This will be submitted 90 days before expiration of contract.

Deliverable: FY06 Statement of work

Milestone	Start Date	End Date	Description
Submit Draft SOW	10/1/05	10/31/04	Draft SOW
Submit Final SOW	11/1/05	11/30/05	Final SOW

Work Element 24: Produce Annual Report
Work Element Title: Annual Report

Details: Prepare and submit annual report to BPA and prepare/submit manuscripts for publication in peer-reviewed scientific journals

Deliverable: Annual report and peer reviewed manuscript

Milestone	Start Date	End Date	Description
Annual report	10/1/2005	12/31/2005	Annual report
Submit annual report Prepare manuscripts	10/1/2005	12/31/2005	Submit annual report Prepare manuscripts

Work Element 25: Produce Scientific Report
Work Element Title: Present results at scientific meetings

Details: Present results of ongoing studies at scientific meetings (American Fisheries Society meeting Anchorage, Alaska September 2005)

Deliverable: Present results at scientific meetings

Milestone	Start Date	End Date	Description
Present results	9/1/2005	12/31/2005	Present results

References

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